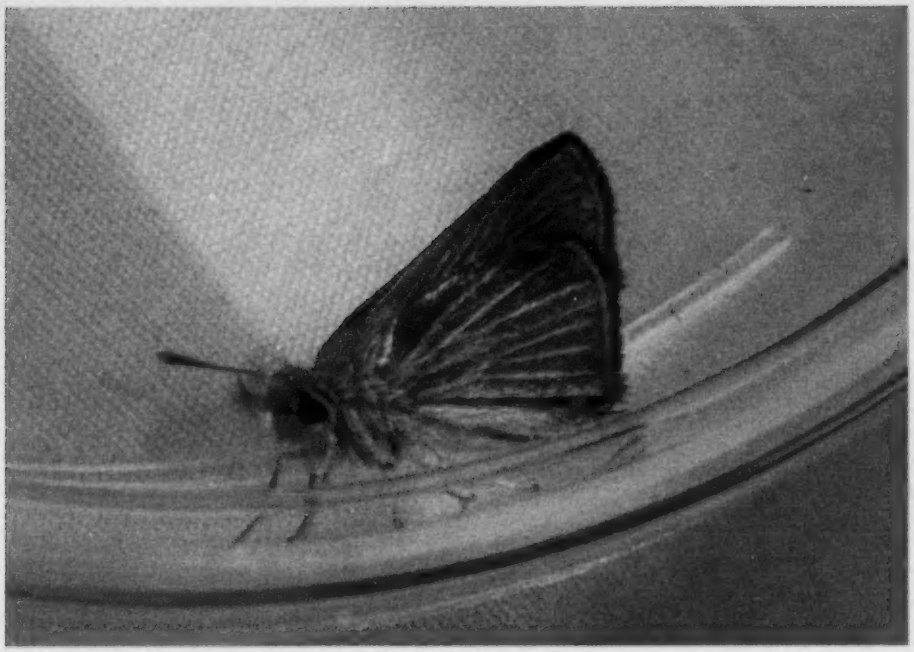
COSEWIC
Assessment and Status Report

on the

Poweshiek Skipperling
Oarisma poweshiek

in Canada



ENDANGERED
2014

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada

COSEPAC
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Previous report(s):

COSEWIC. 2003. COSEWIC assessment and status report on the Poweshiek skipperling *Oarisma poweshiek* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 25 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

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COSEWIC would like to acknowledge Robert Foster and Allan Harris for writing the status report on the Poweshiek Skipperling, *Oarisma poweshiek*, in Canada, prepared under contract with Environment Canada. This report was overseen and edited by Jennifer Heron, Co-chair of the COSEWIC Arthropods Specialist Subcommittee.

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Poweshiek Skipperling — Photo by Allan Harris July 10, 2013.

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COSEWIC
Assessment Summary

Assessment Summary – November 2014

Common name
Poweshiek Skipperling

Scientific name
Oarisma poweshiek

Status
Endangered

Reason for designation
The Canadian population is isolated and disjunct from the populations in United States which are 1000 km to the south. Widespread declines within the past decade on both sides of the border mean Canada holds a significant portion of the species global range. Within Canada this species is restricted to native tall-grass prairie, a habitat that has also undergone similar declines. Although most of the occupied habitat is protected, even with appropriate management, its range is so small that the butterfly is increasingly vulnerable to stochastic events.

Occurrence
Manitoba

Status history
Designated Threatened in November 2003. Status re-examined and designated Endangered in November 2014.

COSEWIC
Executive Summary

Poweshiek Skipperling
Oarisma poweshiek

Wildlife Species Description and Significance

Poweshiek Skipperling is a small butterfly with a wingspan of 24 to 30 mm. The dorsal wing surfaces are dark brown with orange lines along the wing margins. The ventral hindwing has a striking pattern of white scales on the wing veins that contrast with the pale brown background. The species is easily recognized by its fluttery flight pattern. Poweshiek Skipperling is one of a very small group of specialist butterflies that occurs only in native tall grass prairie habitats in Canada. It now persists in one population in Canada and a series of isolated populations in the United States. The loss of this species from Canada would represent the loss of a significant element of the endangered prairie ecosystem.

Distribution

The historical range of Poweshiek Skipperling extended from southeastern Manitoba through the eastern Dakotas and western Minnesota to Iowa, with isolated populations in southeastern Wisconsin, northwestern Illinois and southern Michigan. Its entire historical range remains uncertain because much of the tall grass prairie went under the plough in the mid-1800s and before most butterfly collections in the region began. The global range of Poweshiek Skipperling has substantially contracted since the early 2000s, and it is currently extant in Manitoba, Michigan and Wisconsin. The Canadian range of Poweshiek Skipperling is disjunct from populations in the United States and restricted to about 40 km^2 of prairie habitat in southeastern Manitoba.

Habitat

Poweshiek Skipperling inhabits wet to mesic tall grass prairies in Canada, which range in size from less than 1 ha to several hundred hectares. Prairie habitats often consist of elongated openings among groves of Bur Oak and Trembling Aspen, which provide windbreaks. Habitat patches are a combination of wetter and drier sections of prairie. The wetter areas are dominated by various willows, Tufted Hair Grass, Redtop, Mat Muhly, various sedges, and Slender Spike Rush. The drier areas are dominated by Big Bluestem, Prairie Dropseed, and various forbs. The larval host plants used by Poweshiek Skipperling in Manitoba include Big Bluestem, Indian Grass, and Mat Muhly. Slender Spikerush is also a suspected host plant. The presence of Black-eyed Susan is important because it is the preferred adult nectar plant.

Biology

Poweshiek Skipperling has one generation per year. Flight dates in Manitoba range from late June to late July with peak numbers typically in early to mid-July; adults emerge earlier in warmer years. Adults live for a few days to a week. Males patrol for unmated females by flying low over prairie host plants and grasses. Following mating, oviposition occurs on the upper surface of host plant leaves, and eggs hatch within nine to ten days. Larvae undergo five moults and overwinter as fifth instar larvae on the underside of a blade of grass or on the stem near the base of the host plant. The following spring larvae wake up on warm days, feed and eventually undergo two to four additional moults before pupation begins sometime in early June. Adults emerge after about two weeks. The males disperse 1.0 km to 1.6 km but they are unlikely to disperse across dense woodlands, row crops or habitats not dominated by grasses. Roads may act as barriers between suitable prairie habitat or nectar sources.

Population Sizes and Trends

Population size estimates are unavailable. Changes in population size are difficult to detect due to responses to fire and other disturbance and variation in survey effort. No more than 240 adults have been counted in any given year since 2002. Previous estimates of 5,000 to 10,000 individuals in Canada are likely an overestimate. There is little change in the extent of occurrence or area of occupancy since 2002.

Threats and Limiting Factors

Vegetation succession of open prairie habitats to woody shrubs and trees threatens Poweshiek Skipperling habitat. In the absence of natural disturbance processes such as wildfire or grazing by native Plains Bison, woody species replace prairie vegetation. Prescribed fire and domestic livestock grazing have been used to reduce woody vegetation growth in Poweshiek Skipperling habitat, but excessive, poorly timed, or cumulative disturbance can kill larvae and reduce nectar plant abundance. Wildfires occur at irregular intervals and compound the threat of mortality. Fires with frequencies of less than five years are probably the most serious threats facing Poweshiek Skipperling. Historically, habitat loss and fragmentation were also threats, but now most Canadian sites are protected from habitat conversion. The small extent of occurrence makes the Canadian populations vulnerable to severe weather events.

Protection, Status, and Ranks

Poweshiek Skipperling was assessed Threatened by COSEWIC in 2003 and listed as Threatened under the federal *Species at Risk Act* in 2005. Critical habitat has been identified and includes about 99% of the Canadian population. The species is listed as Endangered under the Manitoba Endangered Species Act. The global status is G1 (critically imperiled), national status N2 (imperiled) in Canada and N1 (critically imperiled) in the United States. The General Status rank for Canada is "May Be at Risk". Most Poweshiek Skipperling habitat is within the Manitoba Tall Grass Prairie Preserve, which is managed for prairie conservation and is unlikely to be developed or converted to other uses.

TECHNICAL SUMMARY

Oarisma poweshiek
Poweshiek Skipperling — Hespérie de Poweshiek
Range of occurrence in Canada: Manitoba

Demographic Information

Generation time	1 year
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? • Population trend in the last 10 years is unknown. Historically, loss of prairie habitat probably caused population declines.	Inferred decline based on the decline of habitat quality.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Inferred decline based on the decline of habitat quality.
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Inferred decline based on the decline of habitat quality.
Are the causes of the decline clearly reversible and understood and ceased? • Causes of decline are historical and linked to prairie habitat loss which is not reversible; current habitat loss at remaining sites is negligible. • Current causes of decline are partially reversible, understood and ceased; habitat enhancement is ongoing at known sites.	Partially reversible; understood and not ceased.
Are there extreme fluctuations in number of mature individuals? • From 2002 to 2013 the number of adults recorded between years varied from 13 – 240 individuals. However, survey effort between years and among sites has not been consistent and is not comparable.	Unknown

Extent and Occupancy Information

Estimated extent of occurrence 41 km² (using all records from 2008 to 2013)	41 km²
Index of area of occupancy (IAO) (2x2 grid value)	40 km²
Is the population severely fragmented? • Most of the habitat patches appear to support viable populations. These populations likely form a metapopulation structure, with some sites repopulating other sites after disturbance events.	No
Number of locations • Based on the threat of fire management practices used to control the encroachment of native woody vegetation and succession in the absence of disturbance (e.g., wildfire and grazing of native Plains Bison) within the two population centres. And the additional threat of unpredictable wildfires.	2 - 5

Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] continuing decline in number of populations?	No
Is there an [observed, inferred, or projected] continuing decline in number of locations?	No
Is there an inferred continuing decline in quality of habitat? • In the absence of natural disturbance (e.g., wildfire or grazing by Plains Bison) or land management actions that mimic this natural disturbance, habitat quality will decline. • Conversely, the cumulative effects of wildfire, prescribed fire, and livestock overgrazing have the potential to increase larval mortality and reduce larval host plant and adult nectar plant abundance.	Yes
Are there extreme fluctuations in number of populations? • The number of occupied sites from 2002 to present is similar.	No
Are there extreme fluctuations in number of locations? • The number of occupied sites from 2002 to present is similar.	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	N Mature Individuals
• Population size estimates are not possible to calculate from existing survey data. • Adult abundance counts between 2002 and 2013 are 13 to 240 individuals.	Unknown
Total	Unknown

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	No data to complete analysis.

Threats (actual or imminent, to populations or habitats)

The main threat is the natural succession of native woody shrubs and trees within the open prairie habitats. In the absence of natural disturbance processes such as wildfire or grazing by native Plains Bison, woody vegetation encroachment is rapid. Natural succession is cumulative when combined with the spread of invasive plant species. Ongoing land management activities that mitigate the threat from natural succession include prescribed fire and domestic livestock grazing. Moderate levels of fire, grazing, or other disturbance are essential to maintain prairie vegetation, but excessive, poorly timed, or cumulative disturbance can kill larvae and reduce nectar plant abundance. Fires with frequencies of less than five years are probably the most serious threats facing Poweshiek Skipperling. Historically, habitat loss and fragmentation were also threats, but now most Canadian sites are protected from habitat conversion. The small extent of occurrence makes the Canadian populations vulnerable to severe weather events.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)?	Declining
Is immigration known or possible?	No
Would immigrants be adapted to survive in Canada?	Yes, likely.
Is there sufficient habitat for immigrants in Canada?	Unknown
Is rescue from outside populations likely?	No

Data Sensitive Species

Is this a data sensitive species?	No

Status History

COSEWIC: Designated Threatened in November 2003. Status re-examined and designated Endangered in November 2014.

Status and Reasons for Designation:

Recommended Status:	**Alpha-numeric code:**
Endangered	B1ab(iii)+2ab(iii); C2a(i)
Reasons for designation: The Canadian population is isolated and disjunct from the populations in United States, which are 1000 km to the south. Widespread declines within the past decade on both sides of the border mean Canada holds a significant portion of the species' global range. Within Canada this species is restricted to native tall-grass prairie, a habitat that has also undergone similar declines. Although most of the occupied habitat is protected, even with appropriate management, its range is so small that the butterfly is increasingly vulnerable to stochastic events.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable.
Criterion B (Small Distribution Range and Decline or Fluctuation): Meets Endangered B1ab(iii)+2ab(iii) since the EO is less than 5,000 km² (41 km²), the IAO is less than 500 km² (40 km²), is known to exist at fewer than 5 locations (2-5), and there is an observed continuing decline in the quality of habitat.
Criterion C (Small and Declining Number of Mature Individuals): Meets Endangered C2a(i). Number of mature individuals unknown but < 10,000. No subpopulation is estimated to contain more than 250 mature individuals.
Criterion D (Very Small or Restricted Population): Meets Threatened D2 since there are two locations and it is prone to the effects of human activities or stochastic events within a very short time period.
Criterion E (Quantitative Analysis): Not completed.

PREFACE

Poweshiek Skipperling (*Oarisma poweshiek*) was assessed as Threatened by COSEWIC in 2003. Since the first status report there has been little apparent change in the extent of occurrence or area of occupancy. There have been surveys in 2006 and annually from 2008 to 2013. Changes in population size are difficult to detect due to variation in survey effort.

The first status report identified excessive grazing and prescribed burning as the most serious threats to Poweshiek Skipperling. Historically, habitat loss and fragmentation were also threats, but now most Canadian sites are protected from this threat. The significance of prescribed fire as a threat is supported by research and monitoring in the United States, but the rapid and synchronous decline over most of these sites, many of which had a long history of prescribed burning, suggest other factors may be contributing to the species' decline.

Research on habitat characteristics and impacts from land management activities is ongoing in Manitoba. A recovery strategy has been completed by Environment Canada and critical habitat is partially identified.

In the United States, Poweshiek Skipperling has undergone a rapid decline since 2000, and is likely extirpated from most sites within its former range.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS
(2014)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment Canada | Environnement Canada
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Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

on the

Poweshiek Skipperling

Oarisma poweshiek

in Canada

2014

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Phylum: Arthropoda - arthropods

Class: Insecta - insects

Subclass: Pterygota - winged insects

Infraclass: Neoptera - ancient winge ' insects

Order: Lepidoptera – butterflies and moths

Superfamily: Hesperioidea

Family: Hesperiidae - skippers

Subfamily: Hesperiinae

Tribe: Thymelicini

Ge[illegible]s: *Oarisma*

Species: *Oarisma poweshiek*

Type locality: Poweshiek County, Iowa

English common name(s): Poweshiek Skipperling, Poweshiek Skipperling, Eastern Skipperling (Scott 1986), Parker's Broad Wing, Iowa Dunn, and Poweshiek Skipper (Selby 2005).

French common name: hespérie de Poweshiek

Taxonomic background and similarities: *Oarisma poweshiek* was first described as *Hesperia poweshiek* in 1870 (Parker 1870). Subsequently, the species was classified to the genus *Oarisma* (Warren *et al.* 2013) which includes seven species in North America, Cuba, Mexico, and Ecuador (Warren *et al.* 2013).

Poweshiek Skippering is considered as a full species in most taxonomic references (Scott 1986; Opler and Warren 2002). Poweshiek Skipperling is sometimes considered as a subspecies of Garita Skipperling (*O. garita*) based on similarities of abdominal structures (Scott 1986). However, the flight periods between these two species differ and no intermediate adults are known (Scott 1986). No subspecies of Poweshiek Skipperling are recognized.

Poweshiek Skipperling was named after the type locality; Poweshiek County, Iowa. The name was misspelled as 'Powesheik' in the original description but later corrected in accordance with the International Code of Zoological Nomenclature (1999). Most literature prior to 1998 has the older spelling.

Morphological Description

Poweshiek Skipperling is small (wingspan of 24 to 30 mm; Figure 1), has hooked antennae and holds its wings partially open at rest, distinguishing it as a skipper (Layberry *et al.* 1998). The dorsal wing surfaces are dark brown with orange lines along the wing margins and basal areas of the front wing. The ventral wing surfaces have a striking pattern of white scales on the veins that contrast with the pale brown background (Figure 1). The sexes are similar although females may be slightly more orange on the dorsal wings than males. It can be recognized at a distance by its fluttery flight (Glassberg 1999).

The pale yellowish-green eggs are slightly elliptical and 0.8 mm long (McAlpine 1972). The larvae (Figure 2) are light green with a dark green dorsal stripe border on each side with white and six whitish lateral stripes. The mature larva (seventh instar) grows to about 24 mm before pupation (McAlpine 1972). The pupa is about 2 cm long and highly cryptic, matching the colour of the grass blade until the body and wings darken a few days ahead of adult emergence (Figure 3) (Runquist pers. comm. 2014).

Poweshiek Skipperling is sometimes confused with Garita Skipperling, a closely related species that also inhabits prairie habitats in Manitoba. Garita Skipperling adults are smaller, more brightly coloured, and lack the white veins on the underside of the hindwing. Garita Skipperling larvae overwinter in the fourth instar rather than fifth instar but are otherwise very similar to those of Poweshiek Skipperling (Scott 1986). There is no information available to distinguish the larvae of these two species.

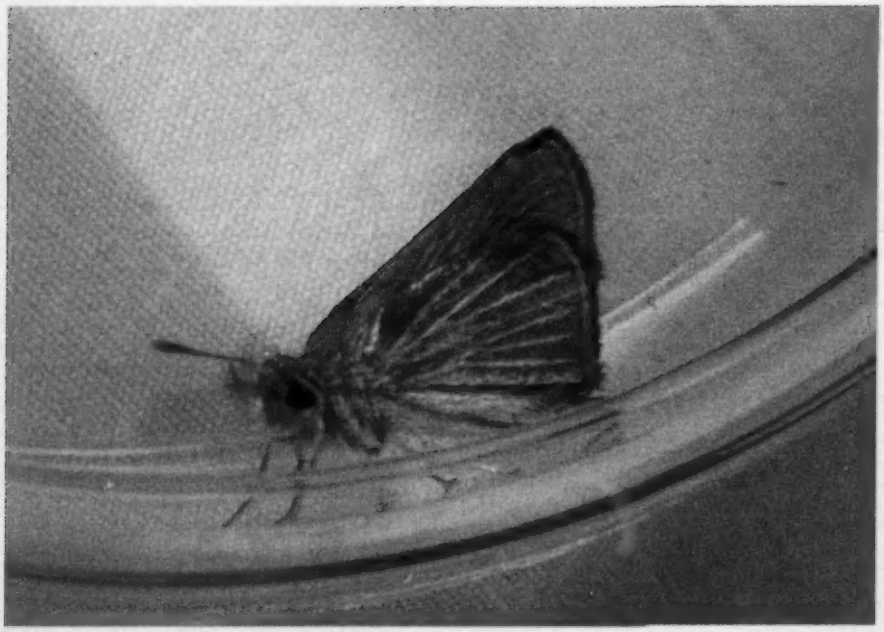

Figure 1. Adult Poweshiek Skipperling. Photo by Allan Harris July 10, 2013.

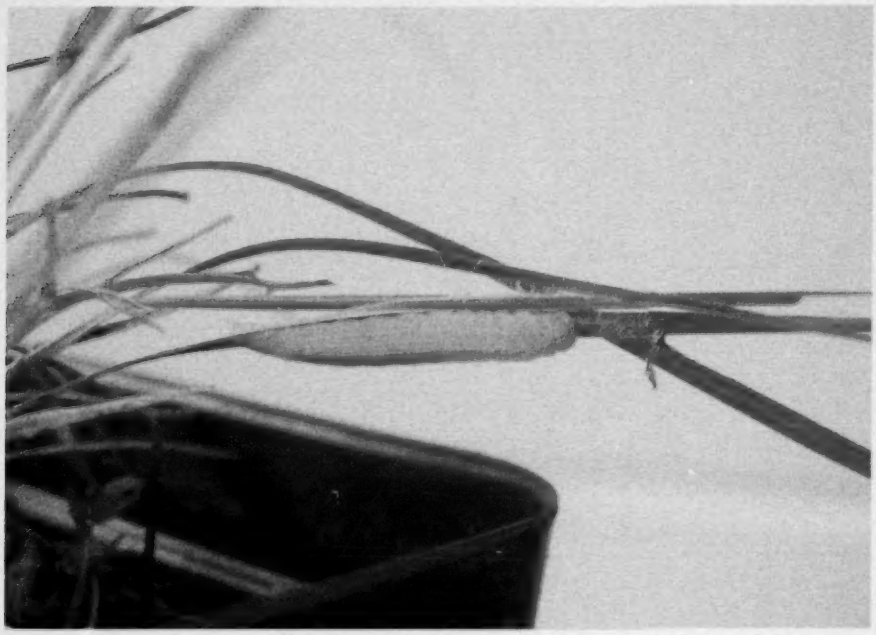

Figure 2. Poweshiek Skipperling larvae. Photo provided by the Minnesota Zoo.

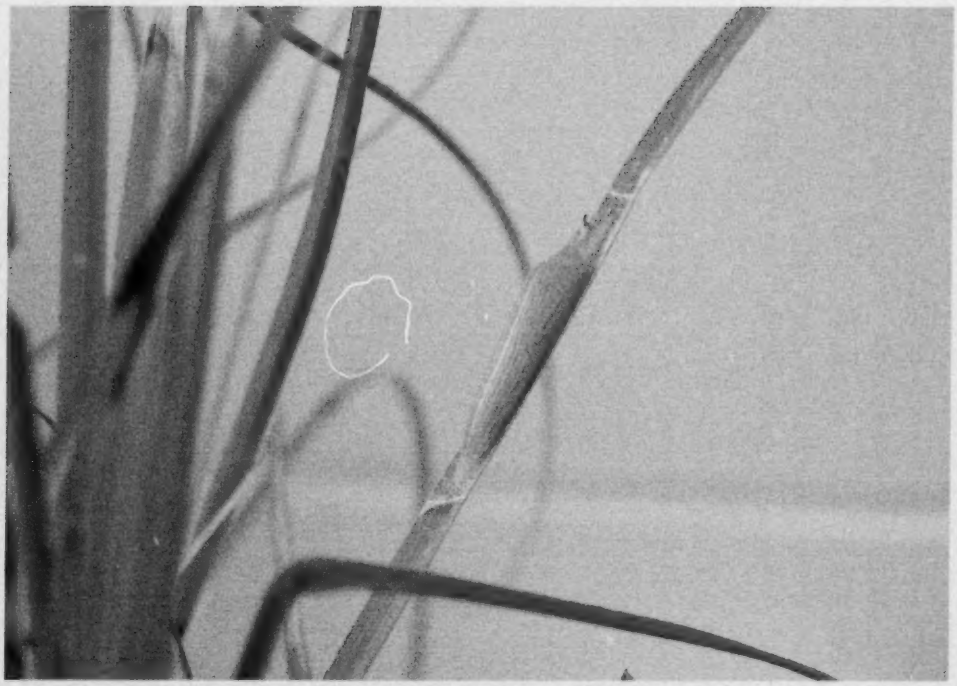

Figure 3. Poweshiek Skipperling pupa. Photo provided by the Minnesota Zoo

Population Spatial Structure and Variability

No genetic studies of Canadian populations are published. However, samples collected in 2013 may clarify the relationship between Canadian and US populations (Saarinen pers. comm. 2013). Results are not yet available.

Designatable Units

Poweshiek Skipperling has one designatable unit in Canada. There are no data on discreteness, genetic structure or evolutionary significance among populations and no subspecies are recognized. The species occurs entirely in the COSEWIC (2011) Prairie National Ecological Area.

Special Significance

Poweshiek Skipperling is one of a very small group of specialist butterflies that occur only in native tall grass prairie habitats in Canada. It now persists in one population in Canada and a series of isolated populations in the United States. The loss of this species from Canada would represent the loss of a significant element of the endangered prairie ecosystem. There is no Aboriginal traditional knowledge available on Poweshiek Skipperling.

DISTRIBUTION

Global Range

The historical range of Poweshiek Skipperling extends from southeastern Manitoba through the eastern Dakotas and western Minnesota to Iowa, with isolated populations in southeastern Wisconsin, northwestern Illinois and southern Michigan (Layberry *et al.* 1998) (Figure 4). Its entire historical range will likely remain unknown because much of the tallgrass prairie was converted for agricultural purposes in the mid-1800s and before butterfly collecting began and the first butterfly surveys were completed.

The global range of Poweshiek Skipperling was 686,304 km^2 in 2000 (measured by convex polygon), including the disjunct populations in Wisconsin and Michigan and the extirpated populations in Illinois and Indiana.

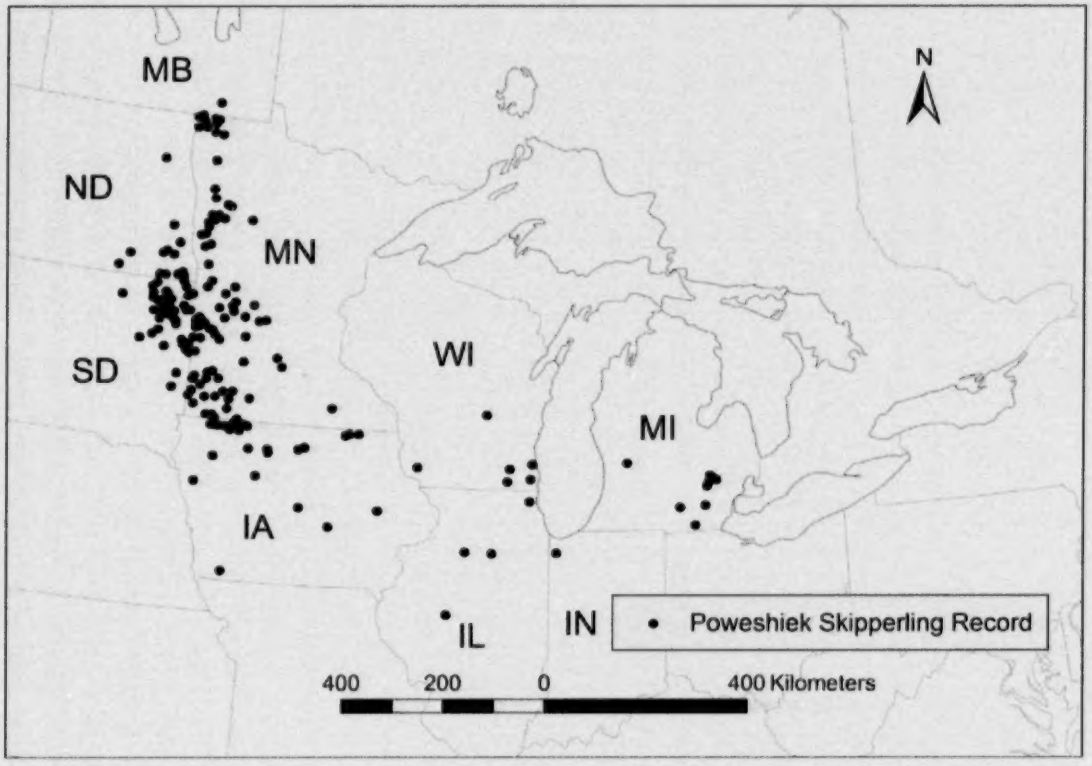

Figure 4. Historical range of Poweshiek Skipperling (Selby 2005). Recent surveys (2005 to 2013) have found the species to be extant only in Manitoba, Wisconsin, and Michigan.

Canadian Range

The Canadian range of Poweshiek Skipperling is restricted to southeastern Manitoba (Figure 5). The species was first recorded in Canada in 1985 at seven sites south of Winnipeg in the Tolstoi, Stuartburn and Gardenton areas (Catling and Lafontaine 1986). This area is referred to as the Manitoba Tall Grass Prairie Preserve and subsequent targeted surveys have not found additional sites beyond this area. Records of Poweshiek Skipperling from Beulah, Manitoba (about 300 km west of Winnipeg) were misidentified and actually Garita Skipperlings (Catling and Lafontaine 1986). Monitoring between 2002 and 2013 has shown no clear evidence of range expansion or contraction. The Manitoba Tall Grass Prairie Preserve is approximately 3332 ha.

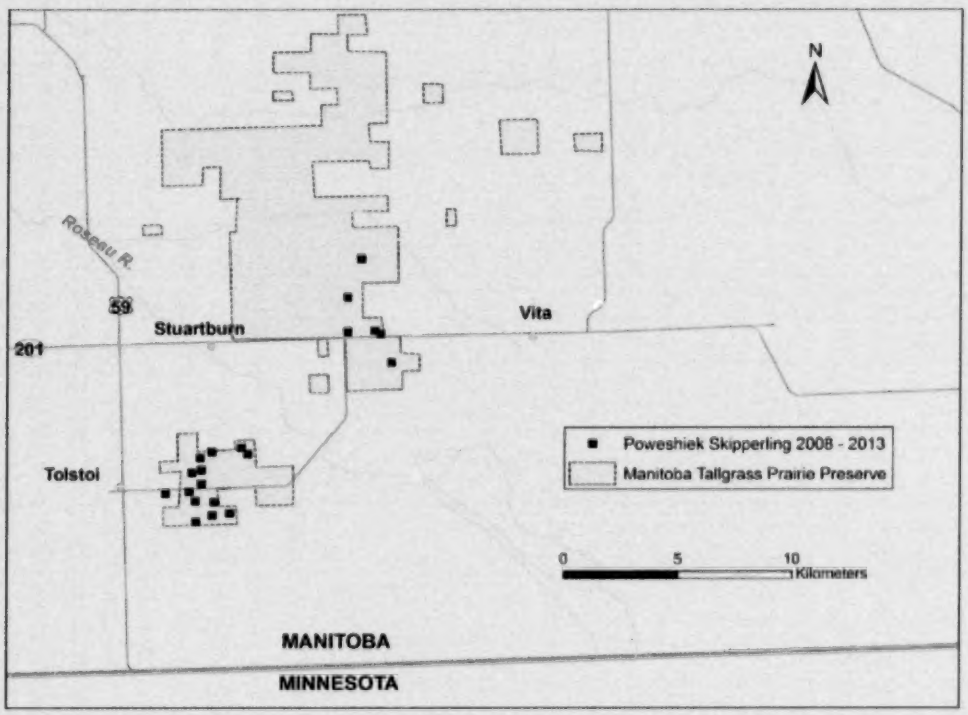

Figure 5. Canadian range of Poweshiek Skipperling based on 2008 to 2013 surveys. The outer boundary of the Manitoba Tall Grass Prairie Preserve is shown. Not all lands within the boundary are protected.

There are two main population centres for Poweshiek Skipperling (Figure 5). The distance between the two main population centres is 7 – 10 km. Canada has less than 1% of the historical global range, but has a substantial portion of the global range if only sites extant in 2013 are included.

Extent of Occurrence and Area of Occupancy

The extent of occurrence (minimum convex polygon) in Canada is 41 km^2. The index of area of occupancy (IAO) (2 km x 2 km grid) is 40 km^2 (10 grid squares). This is consistent with the previous COSEWIC (2003) status report.

Search Effort

Professional and amateur lepidopterists have been active in Manitoba since the late 1800s and the butterfly and skipper fauna in this province is well documented (Klassen *et al.* 1989). However, Poweshiek Skipperling is a recent addition to the provincial fauna and was first recorded in Canada in 1985 (Catling and Lafontaine 1986). No surveys were conducted between 1985 and 2002 (Kornelsen *et al.* 2014), although at least one specimen was collected near Tolstoi in 1994 (Webster 2002). No other collections are reported (Klassen *et al.* 1989, Layberry *et al.* 1998, or eButterfly 2014).

Poweshiek Skipperling surveys are conducted mainly by wandering transects through suitable habitat and checking nectar sources (especially Black-eyed Susan [*Rudbeckia hirta*]) for adults (Cuthrell and Slaughter 2012; Westwood pers. comm. 2013). Surveys are completed during sunny days with no rain, temperature above about 20°C, low to moderate wind and between 09:00 and 18:00. Survey efficiency has probably improved since 2008 due to a better understanding of habitat preferences, improved habitat inventory, the model to predict flight dates, and increased effort (Kornelsen *et al.* 2014).

Surveys in 2002 (during preparation of the first COSEWIC status report) included 55 tall grass prairie patches extending north to the east shore of Lake Manitoba and west to southeastern Saskatchewan (Webster 2002; COSEWIC 2003). This survey recorded 18 Poweshiek Skipperling sites (COSEWIC 2003). In 2013 Poweshiek Skipperling was recorded at 6 sites, all within the area where it was originally recorded during the first status report.

Surveys in the vicinity of the Manitoba Tall Grass Prairie Preserve were completed in 2006, 2008, 2009, 2010, 2011, 2012, and 2013 (Table 3). A total of 101 sites[1] ranging in size from 0.6 ha to 32 ha were surveyed at least once between 2006 and 2013 (Table 3). Potential Poweshiek Skipperling habitat was identified by a roadside survey 2010 and 2011 (Nature Conservancy Canada unpublished data) and through interpretation of aerial imagery and land cover classification derived from Landsat imagery (Kornelsen *et al.* 2014). Surveyors visited sites at least once between 2002 and 2013 and included most of the tall grass prairie patches within the range of Poweshiek Skipperling and most of the potential habitat within the Manitoba Tall Grass Prairie Preserve.

[1] A site is defined as "a distinct prairie meadow generally bounded on all sides by unsuitable habitat (e.g. forest, wetland, roadway)" Westwood *et al.* 2012.

The surveys in 2006, 2008, and 2009 included 15 to 16 sites, but survey effort was not recorded during these surveys (Westwood 2010). In 2010, 20 sites were surveyed including two new sites (Westwood 2010). The 2011 survey covered a total of 61 sites, including 23 sites previously surveyed in 2006 and 2010 as well as 48 additional new sites (some of which lacked suitable habitat) (Westwood *et al.* 2012). In 2012, 86 sites were surveyed including 10 community pastures and 54 other sites never before surveyed. Many of these sites were classified as having poor or unsuitable habitat (Hamel *et al.* 2013). In 2013, 33 sites were surveyed including two new sites (Kornelsen *et al.* 2014).

Since the early 2000s, the range of Poweshiek Skipperling has further declined in the United States despite surveys. The species is now considered extirpated from North Dakota, South Dakota, Iowa, Minnesota, Illinois, and Indiana and extant only in Manitoba, Michigan and Wisconsin (United States Department of the Interior 2013). In Michigan, it is considered extant at ten prairie fens in four counties and in Wisconsin there are three extant populations (Poweshiek Skipperling Workshop Participants 2011). Poweshiek Skipperling was last observed in Iowa in 2008 and surveys in 2013 did not record the species at five of the reserves where it had been most recently observed (Olsen 2013). The most recent observations for the remaining states of its former range are North Dakota (2001), Minnesota (2007), and South Dakota (2009) (Selby 2010; United States Department of the Interior 2013).

HABITAT

Habitat Requirements

Poweshiek Skipperling is an obligate habitat specialist of wet to mesic tall grass prairies in Canada (Catling and Lafontaine 1986; COSEWIC 2003). It is often associated with wetter prairies in Manitoba (Bleho and Koper 2013) and elsewhere, possibly because dry areas burn more frequently than wet areas.

In Manitoba, the tall grass prairie patches which Poweshiek Skipperling inhabits range in size from less than 1 ha to several hundred hectares. Soils are shallow and alkaline. Patch size appears to have little effect on butterfly abundance (Bleho and Koper 2013). Patches are often elongated openings among Bur Oak (*Quercus macrocarpa)* and Trembling Aspen (*Populus tremuloides*) groves (Catling and Lafontaine 1986). Tree cover surrounding foraging sites is apparently important, to provide windbreaks (Bleho and Koper 2013, Hamel pers. comm. 2013).

These tall grass prairie patches are characterized by low relief (at most one or two metres), and most have alternating lower (periodically wetter), and higher (drier) sections, each with a distinctive plant community (Figure 6). The lower wetter areas are often dominated by willow species (*Salix* sp.), Tufted Hair Grass (*Deschampsia cespitosa*), Redtop (*Agrostis gigantea)*, Mat Muhly (*Muhlenbergia richardsonis*), sedges (*Carex* species), and Slender Spike Rush (*Eleocharis elliptica*) (COSEWIC 2003). The drier areas are dominated by Big Bluestem (*Andropogon gerardii*), Prairie Dropseed (*Sporobolus heterolepis*), and various forbs, such as Smooth Death Camas (*Anticlea elegans)*, Stiff-leaved Goldenrod (*Solidago rigida*), Black-eyed Susan (*Rudbeckia hirta)*, and Blazingstar (*Liatris ligulistylis)*. Pale-spiked Lobelia (*Lobelia spicata*) is often present in the transition areas between the mesic and drier prairie. Shrubby Cinquefoil (*Potentilla fruticosa*) is a common small shrub. At most sites Poweshiek Skipperling is most common on or near the border between wet prairie and the higher, drier sections of the prairie where Big Bluestem is common. Larval host plants include a variety of prairie grasses and sedges (see Biology). Nectaring plants, especially Black-eyed Susan, are important sources of food and water for adults.

Elsewhere in its range in the United States, Poweshiek Skipperling habitat includes alkaline fen in Michigan (Holzman 1972) and drier, mesic prairies in the Dakotas, Minnesota, and Iowa (Swengel and Swengel 1999). This habitat is not present in Canada.

Figure 6. Poweshiek Skipperling habitat in the Tall Grass Prairie Preserve, Manitoba. Photo by Allan Harris July 10, 2013.

Habitat Trends

Before Europeans colonized central North America, there were approximately 340,000 km^2 of tall grass prairie (Samson and Knopf 1994). Much of this habitat was lost between 1850 and 1920. Now, 5,000 km^2 remain, which corresponds to a decline of over 99%. In Manitoba, 6,000 km^2 of tall grass prairie existed before arrival of the European settlers in the mid-1800s (Samson and Knopf 1994). Present estimates suggest 50 km^2 (this includes sites that are under a late fall mowing regime) remain, which corresponds to an overall decline of 99.5%.

The historical distribution of Poweshiek Skipperling in North America is difficult to define because much of the tall grass prairie habitat had been converted to row-crop agriculture or severely degraded by overgrazing before butterfly collecting became popular, or butterfly surveys were initiated. Poweshiek Skipperling populations have presumably declined in proportion to the loss of tall grass prairie habitat in North America. Most populations of Poweshiek Skipperling in North America are now highly fragmented and restricted to the few isolated prairie remnants (Royer and Marrone 1992a).

It is not known how widespread Poweshiek Skipperling was in Canada before the loss of tall grass prairie habitat, although historical data compiled by Klassen *et al.* (1989) and Layberry *et al.* (1998) did not discover any records outside the present area of occupancy. A number of suitable but highly fragmented tall grass prairie habitats (approximately 30 km^2) are still present in the inter-lake region of Manitoba between Manitoba and Winnipeg lakes (COSEWIC 2003; COSEWIC 2014). No populations of Poweshiek Skipperling are known to occur within these habitats, although the Dakota Skipper (*Polites dakotae*) and Garita Skipperling is still within these areas. It is possible that Poweshiek Skipperling always had a limited distribution in Canada.

There has apparently been little loss of tall grass prairie habitat in Manitoba in the last few decades. The shallow, rocky, highly calcareous soils in the areas where Poweshiek Skipperling now occurs in Canada are unsuitable for most agricultural uses. The small size (0.4 to 0.8 ha) of many prairie openings, combined with the presence of unpalatable livestock forage plants, particularly on the higher ground, make these sites generally unsuitable for grazing (Catling and Lafontaine 1986). As a result, the flora of these sites has not been significantly altered by agriculture. Since the 1990s, the Nature Conservancy of Canada and other conservation groups have acquired many of the remaining patches of prairie in southeastern Manitoba, creating the Tall Grass Prairie Preserve.

BIOLOGY

Most of the available information on Poweshiek Skipperling biology has been gained from survey and monitoring reports in both Canada and the United States (e.g. Borkin 2005, Semmler 2010, Swengel et al 2011; United States Department of the Interior 2013), a captive breeding program at the Minnesota Zoo (Runquist pers. comm. 2014), and presentations at the Northern Tallgrass Prairie Lepidoptera Conservation Conference in March 2013.

Life Cycle and Reproduction

Poweshiek Skipperling has one generation per year. Flight dates in Manitoba range from late June to late July with peak numbers typically in early to mid-July (COSEWIC 2003, Richard Westwood pers. comm. 2013). Emergence dates are closely correlated with degree-days and in warmer summers adults emerge earlier (Westwood pers. comm. 2013). The flight period typically lasts three to four weeks, but individual adults live only a few days to a week (Westwood pers. comm. 2013).

Males patrol the habitat for unmated females by flying low over the grasses (COSEWIC 2003). They typically patrol around a chosen perch, chasing off proximal and potential male competition and occasionally spiralling up above the grasses (Borkin 1994). Upon discovering a perched female the male lands and attempts to copulate (Borkin 1995). No hybrids have been described for this species although the range overlaps with the closely related Garita Skipperling.

Females lay their eggs on the upper surface of host plant leaves. The number of eggs produced during the lifetime of a wild female is unknown, but captive females laid up to 35 eggs over two days (range 0-35, average across 16 females from Michigan and 1 from Manitoba = 16) (Runquist pers. comm. 2014). The eggs hatch in nine to 10 days.

Overall, the larvae go through seven (Scott 1986) to nine (McAlpine 1972) instars. Larvae appear to spend all their time on the host plant, unlike many species of skippers, which make a silk-lined shelter on the ground (Scott 1986). When not feeding, they rest on the underside of the grass stem. The first three larval instars last from 10 to 15 days, while the fourth lasts about 25 days (McAlpine 1972). Larvae cease feeding in late September during the fifth instar and enter diapause (McAlpine 1972). Larvae overwinter on the underside of a blade of grass (McAlpine 1972) or on the stem near the base of the host plant (Borkin 1995). Several larvae that were overwintered outdoors resumed feeding in early April, moulted to the sixth instar in mid-April and to the last instar on May 14 (McAlpine 1972). Pupation occurs on grass blades, often several inches above the surface of the ground; the species does not build structures or spin loose cocoons (Runquist pers. comm. 2014). The pupal stage lasted two weeks for two captive Poweshiek Skipperlings in Wisconsin (Borkin 1995).

Poweshiek Skipperling larvae feed on a variety of grasses and sedges. Host plants used in Manitoba include Big Bluestem (*Andropogon gerardii*), Indian Grass (*Sorghastrum nutans*), and Mat Muhly (*Muhlenbergia richardsonis*) (Dupont 2010). Plants used elsewhere include Slender Spikerush (*Eleocharis elliptica*) and sedges (Cyperaceae) in Michigan (Cuthrell 2012, Holzman 1972); and Prairie Dropseed (*Sporobolus heterolepis*) and Little Bluestem (*Schizachyrium scoparium*) in Wisconsin (Borkin 1995b Dana 2005a). All of these plants occur in the Manitoba Tall Grass Prairie Preserve (Manitoba Conservation 2012).

In Manitoba the primary nectar plant is Black-eyed Susan, followed by Upland White Aster (*Solidago ptarmicoides*) (COSEWIC 2003; Semmler 2010; Bleho and Koper 2013; Westwood pers. comm. 2013). Sugar concentration in the nectar of these plants is relatively low compared to other available flowers, suggesting that nectaring is done primarily for water or nutrients rather than as a source of energy (Semmler 2010). Pale-spiked Lobelia is also a nectar source in Manitoba (Catling and Lafontaine 1986, COSEWIC 2003). These plant species were more common in a site burned seven years prior to sampling than in a site burned one year before sampling (Semmler 2010). Elsewhere in the species' range, Smooth Oxeye (*Heliopsis helianthoides*), Purple Coneflower (*Echinacea angustifolia*), and Coreopsis (*Coreopsis palmata*) are among the preferred flower species (Swengel and Swengel 1999).

Physiology and Adaptability

Poweshiek Skipperling is extremely susceptible to habitat changes and is rarely recorded within prairies that have been ploughed or converted to non-native vegetation (Royer and Marrone 1992a, Schlicht and Saunders 1994, Swengel and Swengel 1999). Although the immature stages and adults can use a variety of plant species for feeding and reproduction, they appear to be restricted to using species associated with native prairies.

Dispersal and Migration

Poweshiek Skipperling does not migrate. Adult dispersal is limited by the short flight period, the weak flight, and low connectivity between prairie habitat patches. Maximum dispersal distances for male Poweshiek Skipperlings is estimated at 1.0 km to 1.6 km (Burke *et al.* 2011). In contrast, estimated maximum dispersal distance for Garita Skipperling is two to three times greater (Burke *et al.* 2011). A few adult Poweshiek Skipperlings were observed visiting roadside flowers 0.5 km from the closest tall grass prairie habitat near the Tall Grass Prairie Preserve in Manitoba, suggesting that they disperse along roadsides (COSEWIC 2003). The species is unlikely to disperse across dense woodlands, row crops or other areas not dominated by grasses (Westwood 2012). Roads may act as barriers between suitable prairie habitat or nectar sources (Westwood 2012).

Interspecific Interactions

Little information is available on natural mortality factors that impact Poweshiek *Skipperling. Predation by a crab spider (Araneida: Thomisidae) and ambush bugs* (Hemiptera; Reduviidae) on nectar-feeding Poweshiek Skipperlings has been observed (Swengel and Swengel 1999). Other potential predators include birds, orb weaving spiders, and parasitoid wasps. However, predation is probably not a significant mortality factor in this species (Semmler 2010; US Department of the Interior 2013). Evidence of predation or parasitism was observed on 8% of eggs in a Poweshiek Skipperling population in Wisconsin (Borkin 1995).

Interactions of Poweshiek Skipperling with Peck's Skipper (*Polites peckius*), were observed in the Tall Grass Prairie Preserve (COSEWIC 2003). Peck's Skippers pursued patrolling male Poweshiek Skipperlings that flew near their perch. The two individuals broke off after one or two seconds. It is unlikely that courtship-related interspecific interactions interfere (loss of time) with the mating activity of Poweshiek Skipperling (COSEWIC 2003).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

Poweshiek Skipperling population size estimates are not possible to calculate. Most Poweshiek Skipperling studies (1985 – present; summarized in Search Effort) lack sample effort data (e.g., 2006 – 2009) and have focused on recording the species presence and abundance. Thus population comparisons among sites and years are difficult to make. However, surveys from 2010 to 2013 consist of multiple visits during the predicted adult flight period, and the 2012 and 2013 dates were based on an emergence model (Westwood pers. comm. 2013). Survey effort was recorded in minutes of time spent searching and the number of adults counted at each site was standardized as the number observed per 60 minutes of survey time (Kornelsen *et al.* 2014). In 2011, a range of estimated numbers was tallied rather than a count of individuals (Westwood *et al.* 2012). Sites surveyed in 2013 ranged in size from 0.6 ha to 32 ha.

Abundance

When first recorded in 1985, Poweshiek Skipperling was reported as being "locally abundant" (Catling and Lafontaine 1986). Reports of the species being "historically common" in Manitoba (US Department of the Interior 2013) apparently refer to the 1985 report or perhaps to the misidentified records of Garita Skipperling.

Surveys conducted between 2002 and 2013 (Table 1) had adult counts from 13 to 240 individuals. The 2002 survey made a rough population estimate of about 3,000 individuals, but only about half of the habitat blocks were surveyed and the survey timing may not have been during the peak flight period. Therefore the author estimated a total of 5,000 to 10,000 adults (COSEWIC 2003) by projecting observed densities to the amount of unsurveyed habitat. The 2002 survey found density of adults to vary from zero individuals per hectare on four sites that had been burned during the spring of 2002, to 46 adults per hectare on a site with no recent management (COSEWIC 2003).

Table 1. Poweshiek Skipperling survey effort 2002 - 2013. A site is defined as "a distinct prairie meadow generally bounded on all sides by unsuitable habitat (e.g. forest, wetland, roadway)" (Westwood *et al.* 2012). See also Table 3.

Year	Total Effort (Search effort in person minutes)	Sites surveyed	Sites with Poweshiek Skipperling	Total Adults Counted	Reference
2002	555	18	15	154	Webster 2002
2006	no data	16	7	126	Westwood 2010
2008	no data	15	8	240	Westwood 2010
2009	no data	15	6	79	Westwood 2010
2010	1650	20	5	13	Westwood 2010
2011	3800	61	17	220*	Westwood *et al.* 2012
2012	4877	86	11	50*	Hamel *et al.* 2013
2013**	>7576	31	6	45*	Kornelsen *et al.* 2014

* adults were not marked during surveys and may be double-counted.
** some surveys with no effort recorded

Surveys from 2008 to 2013 included most of the tall grass prairie habitat within the Tall Grass Prairie Preserve and did not record more than 240 adults despite more extensive effort and improved survey efficiency. It seems unlikely that there are as many as 3000 adults. An estimate of several hundred adults is probably more accurate.

Fluctuations and Trends

Population trends are difficult to determine from available data. Adult abundance counts between 2002 and 2013 ranged from 13 to 240 individuals (Table 1) but differences in survey effort and the influence of fires in the years preceding the survey make it difficult to compare numbers or sites between years. In some years only the best sites were visited, but in other years (e.g. 2012) many marginal sites were surveyed.

Survey data from 2002 to 2013 suggest that populations fluctuate from year to year (Table 1, Table 3), possibly in response to fires in the years preceding the survey (Kornelsen *et al.* 2014).

Data are inadequate to determine if the Canadian population is subject to "extreme fluctuations" (i.e. fluctuating over an order of magnitude from one year to the next; International Union of Conservation Networks 2013).

There are no data on historical population fluctuations and trends for Poweshiek Skipperling in Canada. However, the loss of most of the tall grass prairie in Canada (Hall *et al.* 2011, Willms *et al.* 2011) can be used to infer that populations declined between the mid-1800s and the 1990s (COSEWIC 2003, Selby 2005). Habitat within the range of Poweshiek Skipperling has probably been relatively stable since at least the 1980s.

Poweshiek Skipperling populations in the United States have declined since the early 2000s for reasons not yet fully understood, but probably related to burning (Royer and Marrone 1992a, Swengel *et al.* 2011, Swengel and Swengel 2012). Other prairie specialist butterflies have similarly declined (Swengel *et al.* 2010). Poweshiek Skipperling populations in the US are also subject to significant fluctuations from year to year, making the longer term trend difficult to recognize (Swengel and Swengel 2012).

Rescue Effect

Rescue effect is not possible. The species is considered extirpated from the closest sites in Minnesota and North Dakota. The nearest known extant populations are in Wisconsin, almost 1000 kilometres from the Manitoba sites. This far exceeds the probable dispersal capability of Poweshiek Skipperling. Suitable tall grass prairie in the intervening area is rare and fragmented.

THREATS AND LIMITING FACTORS

The maintenance of open prairie habitats includes periodic natural disturbance events. Historically these included grazing by Plains Bison (*Bison bison*), wildfires and flooding events. Today, such events, while good for maintaining habitat, need to also consider the high probability that excessive disturbance can kill larvae and suppress desired host and nectar plants needed for Poweshiek Skipperling. Prairie habitats where grazing and fire are excluded will eventually become unsuitable for many species of prairie plants and insects due to the growth of woody shrubs and taller grasses, accumulation of litter, reduction of nectar sources, and invasion by exotic plants (McCabe 1981).

The International Union for Conservation of Nature-Conservation Measures Partnership (2006) (IUCN-CMP) threats calculator was used to classify and list threats to Poweshiek Skipperling (Salafsky *et al.* 2008; Master *et al.* 2009). The overall Threat Impact for Poweshiek Skipperling is Very High (Table 2). Major level 1 threats (highest to lowest impact) include 7 Natural systems modifications (fire and fire suppression), 8 Invasive and other Problematic Species and Genes, and 2 Agriculture and Aquaculture.

Table 2. The IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system was used to determine a threat impact for Poweshiek Skipperling. For a description of the threat classification system see the CMP website (CMP 2010) and Master *et al.* (2009).

Date:	May 14, 2014			
Assessor(s):	Allan Harris (report author), Rob Foster (report author), Dave McCorquodale (Arthropods SSC Member), Jenny Heron (Arthropods SSC Co-chair), Angele Cyr (COSEWIC Secretariat), Marie-France Noel (CWS)			
			Level 1 Threat Impact Counts	
	Threat Impact		high range	low range
	A	Very High	0	0
	B	High	2	0
	C	Medium	1	0
	D	Low	0	3
Calculated Overall Threat Impact:			Very High	Low
Overall Threat Comments			The main threats to Poweshiek Skipperling are competition to larval host plants and nectar sources from the natural succession of native woody shrubs and trees within the open prairie habitats. In the absence of natural disturbance process such as wildfire or grazing by native Plains Bison, woody vegetation encroachment is rapid. Natural succession is cumulative when combined with the spread of invasive plant species. Ongoing land management activities that mitigate the threat from natural succession include prescribed fire and domestic livestock grazing. Moderate levels of fire, grazing, or other disturbance are essential to maintain prairie vegetation, but excessive, poorly timed, or cumulative disturbance can kill larvae and reduce nectar plant abundance. Fires with frequencies of less than five years are probably the most serious threats facing Poweshiek Skipperling.	

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1	Residential & commercial development	Negligible	Negligible (<1%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	
1.1	Housing & urban areas	Negligible	Negligible (<1%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	Most of the occupied sites (99%) are owned by the Nature Conservancy of Canada and not under threat of urban development. There is little potential unsearched habitat, and this habitat is not under threat from housing or urban development. The human population density remains low and the area is over 60 km from the nearest urban centre.
1.2	Commercial & industrial areas	Negligible	Negligible (<1%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	Most of the occupied sites (99%) are owned by the Nature Conservancy of Canada and not under threat of commercial and industrial development. There is little potential unsearched habitat, and this habitat is not under threat from housing or urban development. The human population density remains low and the area is over 60 km from the nearest urban centre.
1.3	Tourism & recreation areas	Negligible	Negligible (<1%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	Nature Conservancy Canada may consider washroom facilities and trail expansion but this is a small area and not likely to impact Poweshiek Skipperling sites.
2	Agriculture & aquaculture	Medium - Low	Restricted - Small (1-30%)	Serious - Moderate (11-70%)	High (Continuing)	Overgrazing is the threat, not grazing. This is more anecdotal.
2.1	Annual & perennial non-timber crops	Low	Small (1-10%)	Serious - Moderate (11-70%)	Moderate (Possibly in the short term, < 10 yrs)	There are a few sites adjacent to the Tall Grass Prairie Preserve that could potentially be converted to hayfields or converted to improve pasture for livestock.
2.2	Wood & pulp plantations					Not applicable.
2.3	Livestock farming & ranching	Medium - Low	Restricted (11-30%)	Serious - Moderate (11-70%)	High (Continuing)	Livestock overgrazing is a threat to some sites.
2.4	Marine & freshwater aquaculture					Not applicable.
3	Energy production & mining	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	
3.1	Oil & gas drilling	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Oil and gas activities are not considered threats within the next ten years.

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
3.2	Mining & quarrying	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Gravel extraction threatens some tall grass prairie habitats in Manitoba (Hamel *et al.* 2006), but is not a current threat at the known Poweshiek Skipperling sites. Mining is not considered a threat within the next ten years.
3.3	Renewable energy	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Wind turbine or solar power are not considered threats within the next ten years, wind turbines are further to the west of the Poweshiek Skipperling sites, and within the Altona area.
4	Transportation & service corridors	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	
4.1	Roads & railroads	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Roads can act as barriers to movement of Poweshiek Skipperlings (Westwood 2010) and existing roads may restrict dispersal between habitat patches. Further road development is not considered a threat. Road expansion is unlikely; there is an established prairie road grid. These roads are maintained but not likely to be widened. Roadsides are typically mowed; not sprayed with herbicide.
4.2	Utility & service lines					Not applicable.
4.3	Shipping lanes					Not applicable.
4.4	Flight paths					Not applicable.
5	Biological resource use					
5.1	Hunting & collecting terrestrial animals	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Collecting of Poweshiek Skipperlings is not considered a threat. Permits are required.
5.2	Gathering terrestrial plants	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Larval host plants and adult nectar sources are not considered plants likely to be collected for human use.
5.3	Logging & wood harvesting	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	Historically there has been some logging at occupied and adjacent sites; these sites are unlikely to be harvested within the future.
5.4	Fishing & harvesting aquatic resources					Not applicable.

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
6	Human intrusions & disturbance	Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	
6.1	Recreational activities	Negligible	Large (31-70%)	Negligible (<1%)	High (Continuing)	Recreational use of the Tall Grass Prairie Preserve includes hiking and wildlife viewing, primarily along existing trails (Hamel pers. comm. 2013). The impacts on Poweshiek Skipperling are unknown, but probably not significant. ATV use is not permitted on the Nature Conservancy of Canada lands; there is some ATV use on the potential adjacent habitat sites but not considered a significant threat. Mountain biking is considered a low threat, and mainly confined to existing trails.
6.2	War, civil unrest & military exercises					Not applicable.
6.3	Work & other activities		Large (31-70%)	Unknown	High (Continuing)	Lands in the Tall Grass Prairie Preserve are subject to prescribed burning and grazing to maintain prairie vegetation. The effects on Poweshiek Skipperling populations are described elsewhere in this report. Poweshiek Skipperling population monitoring is completed under the conditions of research permits from (i) the Manitoba Conservation and Water Stewardship Wildlife Branch and (ii) the Tall Grass Prairie Management Committee. Permits are issued to coordinate the efforts of surveyors to minimize disturbance to vegetation and restrict the number of skipperlings that may be collected.
7	Natural system modifications	High - Low	Large (31-70%)	Serious - Slight (1-70%)	High (Continuing)	
7.1	Fire & fire suppression	High - Low	Large (31-70%)	Serious - Slight (1-70%)	High (Continuing)	There have been at least three wildfires in the last 10 years; some farmers burn hayfields and pastures and these fires get out of control; when get unexpected wildfires it may not be good for the butterfly when combined with the prescribed burning. Wildfires can burn very large areas and can be quite detrimental to the species. Wildfires occurred in 2009, 2011 and 2012. Fire suppression activities in some of the occupied sites; fire suppression is a historical threat that has resulted in prairies being converted to aspen stands; all the habitats are being managed by grazing, etc. Without prescribed burning wildfire may not have a detrimental effect, but in combination this is a problem.
7.2	Dams & water management/ use					Not applicable.

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
7.3	Other ecosystem modifications					Not applicable.
8	Invasive & other problematic species & genes	Medium - Low	Large - Restricted (11-70%)	Moderate - Slight (1-30%)	High (Continuing)	
8.1	Invasive non-native/alien species	Low	Large (31-70%)	Slight (1-10%)	High (Continuing)	There are some invasive species that are present in southeastern Manitoba. However, these species are suppressed during burns. Present at most sites.
8.2	Problematic native species	Low	Restricted (11-30%)	Moderate (11-30%)	High (Continuing)	The growth of native shrubs and woody plants into the open prairie habitats is an ongoing threat.
8.3	Introduced genetic material					No translocations planned for Canada; the state of Minnesota has plans to collect eggs and rear them in the Minnesota Zoo.
9	Pollution	Negligible	Small (1-10%)	Negligible (<1%)	High (Continuing)	
9.1	Household sewage & urban waste water	Negligible	Small (1-10%)	Negligible (<1%)	High (Continuing)	Road salt is a potential threat in Michigan but not likely not a threat in Manitoba.
9.2	Industrial & military effluents					Not applicable.
9.3	Agricultural & forestry effluents	Not a Threat (in the assessed timeframe)			Insignificant/ Negligible (Past or no direct effect)	The spray of agricultural and forestry effluents is not considered a threat (Hammel pers. comm. 2014). Gypsy Moth (*Lymantria dispar*) is not considered a threat and thus no spray programs are in place to control this species. There are no agricultural crops nearby that require pesticide application. Most adjacent crops are hay fields, although it is possible alfalfa and canola fields may be sprayed. Roadsides are typically mowed; not sprayed with herbicide.
9.4	Garbage & solid waste					Not applicable.
9.5	Air-borne pollutants					Not applicable.
9.6	Excess energy					Not applicable.
10	Geological events					
10.1	Volcanoes					Not applicable.
10.2	Earthquakes/ tsunamis					Not applicable.
10.3	Avalanches/ landslides					Not applicable.

Threat		Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
11	Climate change & severe weather		Small (1-10%)	Unknown	High (Continuing)	
11.1	Habitat shifting & alteration		Unknown	Unknown	High (Continuing)	Climate change could lead to shifts in plant communities, which in turn could affect Poweshiek Skipperling survival and reproduction if nectar sources are not available during the critical adult flight period (Environment Canada 2012).
11.2	Droughts		Unknown	Unknown	High (Continuing)	This butterfly has some preferred nectar plants, and if host plant flowering and senescence changes then this would impact butterfly abundance. Adults only live a few days. If it doesn't have the preferred plants, research doesn't show that the butterfly won't use other species. Drought is considered but not temperature extreme.
11.3	Temperature extremes					Not applicable.
11.4	Storms & flooding		Small (1-10%)	Unknown	Moderate (Possibly in the short term, < 10 yrs)	Some Poweshiek Skipperling habitat is vulnerable to flooding from heavy spring runoff and severe rainstorms. Although some flooding has probably always occurred on these sites, natural hydrological processes may have been altered by ditches and stream channelization (Environment Canada 2011) and road building (Hamel pers. comm. 2013) and increased the frequency and duration of flood events. There have been flooding events where butterfly has been flooded during normal flight period.

Table 3. Poweshiek Skipperling search effort in Manitoba 2002 – 2013 (summarized from Kornelsen *et al.* 2014, Hamel *et al.* 2013, Westwood 2010, Westwood *et al.* 2012, Webster 2002). Minutes of search effort are listed for 2010 to 2013, but were unavailable for other years. Years with records of Poweshiek Skipperling are shaded. "-"indicates no survey. "Yes" indicates Poweshiek Skipperling was present. "No" indicates Poweshiek Skipperling was not detected. A site is defined as "a distinct prairie meadow generally bounded on all sides by unsuitable habitat (e.g. forest, wetland, and roadway)" (Westwood *et al.* 2012). The site names used here were established by previous surveys. Values in cells represent search effort in person-minutes.

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
CP1	No	-	-	-	-	-	-	180	-
CP2	No	-	-	-	-	-	-	40	-
CP3	No	-	-	-	-	-	-	50	-
CP6	No	-	-	-	-	-	-	30	-

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
CP9	No	-	-	-	-	-	-	60	-
CP10	No	-	-	-	-	-	-	40	-
CP11	No	-	-	-	-	-	-	-	-
CP12	No	-	-	-	-	-	-	40	-
CP14	No	-	-	-	-	-	-	40	-
CP15	No	-	-	-	-	-	-	50	-
1	No	-	-	-	-	75	30	-	-
2	No	-	-	-	-	75	30	-	-
3	Yes	-	Yes	Yes	Yes	100	80	165	>420
4	Yes	165	Yes	Yes	Yes	100	60	90	420
5	Yes	75	Yes	Yes	Yes	100	60	75	480
6	Yes	30	Yes	Yes	No	75	20	-	120
7	No	15	-	-	-	100	20	-	-
8	Yes	-	Yes	Yes	Yes	100	80	240	>1570
9	Yes	55	Yes	Yes	Yes	75	60	120	150
10	Yes	45	No	Yes	Yes	75	30	-	60
11	No	-	No	No	No	100	30	30	60
12	Yes	-	Yes	Yes	No	75	-	30	60
13	No	-	No	No	No	75	-	30	-
14	No	-	No	No	No	75	-	-	-
15	Yes	-	-	-	-	75	30	30	-
16	No	-	No	-	-	75	-	-	-
17	No	-	No	No	No	75	-	-	-
18	No	-	No	No	No	75	-	30	-
19	No	-	No	No	No	75	-	-	-
20	No	-	No	No	No	75	-	-	-
21	Yes	-	-	-	-	-	120	180	>510
22	Yes	-	-	-	-	-	120	180	>390
23	Yes	-	-	-	-	-	90	60	90
24	Yes	-	-	-	-	-	60	60	>60
25	Yes	-	-	-	-	-	80	135	360
26	Yes	-	-	-	-	-	60	135	210
27	Yes	15	-	-	-	-	60	15	180
28	No		-	-	-	-	60	30	-

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
29	Yes	15	-	-	-	-	60	-	240
30	No	-	-	-	-	-	60	30	-
J7	Yes	-	-	-	-	-	90	-	-
J11	Yes	15	-	-	-	-	80	-	-
J12	Yes	-	-	-	-	-	60	-	-
J13	No	-	-	-	-	-	120	-	-
J17 a,b	Yes	-	-	-	-	-	50	-	-
J31	No	-	-	-	-	-	0*	-	-
J32	No	-	-	-	-	-	90	-	-
J33	No	-	-	-	-	-	120	-	-
J34	No	-	-	-	-	-	30	-	-
J35	No	-	-	-	-	-	0*	-	-
J36	No	-	-	-	-	-	90	-	-
J40	No	-	-	-	-	-	0*	30	-
J41	No	-	-	-	-	-	60	-	-
J42	No	-	-	-	-	-	60	-	180
J43	No	-	-	-	-	-	20	-	-
J44	No	-	-	-	-	-	20	-	-
J45	No	-	-	-	-	-	20	-	-
J46	No	-	-	-	-	-	20	-	-
J47	No	-	-	-	-	-	45	-	-
J48	No	-	-	-	-	-	0*	-	-
J50	Yes	10	-	-	-	-	140	-	-
J51	No	-	-	-	-	-	45	-	-
J52	No	-	-	-	-	-	20	-	-
J53	No	-	-	-	-	-	20	-	-
J54	No	-	-	-	-	-	20	-	-
J55	No	-	-	-	-	-	20	-	-
J57	No	-	-	-	-	-	60	-	-
J58	No	-	-	-	-	-	90	-	-
J59	No	-	-	-	-	-	110	-	-
J60	No	-	-	-	-	-	60	-	-
J61	No	-	-	-	-	-	160	-	115
J62	No	-	-	-	-	-	0*	-	-

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
J63	No	-	-	-	-	-	40	-	-
J66	No	-	-	-	-	-	0*	-	-
J67	Yes	-	-	-	-	-	140	120	195
J68	No	-	-	-	-	-	40	-	-
J69	No	-	-	-	-	-	105	-	-
J71	No	-	-	-	-	-	120	-	-
J72	Yes	-	-	-	-	-	90	-	-
J73	Yes	10	-	-	-	-	30	-	-
J74	No	-	-	-	-	-	45	-	-
J75	No	-	-	-	-	-	40	-	-
J76	No	-	-	-	-	-	40	-	-
J77	No	-	-	-	-	-	30	-	-
J78	No	-	-	-	-	-	60	-	-
JB1	No	-	-	-	-	-	-	60	-
JB2	Yes	15	-	-	-	-	-	45	-
JB3	Yes	15	-	-	-	-	-	150	80
JB4	Yes	60	-	-	-	-	-	90	470
JB5	No	-	-	-	-	-	-	150	125
JB6	No	-	-	-	-	-	-	45	-
JB7	No	-	-	-	-	-	-	30	140
JB8	No	-	-	-	-	-	-	80	165
JB9	No	-	-	-	-	-	-	60	-
JB10	No	-	-	-	-	-	-	50	-
JB11	No	15	-	-	-	-	-	60	-
JB12	No	-	-	-	-	-	-	160	-
JB13	No	-	-	-	-	-	-	100	360
JB14	No	-	-	-	-	-	-	15	-
JB15	No	-	-	-	-	-	-	45	-
JB16	No	-	-	-	-	-	-	60	-
JB17	No	-	-	-	-	-	-	150	-
JB18	No	-	-	-	-	-	-	40	-
JB19	No	-	-	-	-	-	-	30	-
JB20	No	-	-	-	-	-	-	30	-
JB21	No	-	-	-	-	-	-	30	-

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
JB22	No	-	-	-	-	-	-	30	-
JB23	No	-	-	-	-	-	-	30	-
JB24	No	-	-	-	-	-	-	30	-
JB25	No	-	-	-	-	-	-	30	48
JB26	No	-	-	-	-	-	-	25	-
JB27	No	-	-	-	-	-	-	-	-
JB28	No	-	-	-	-	-	-	5	-
JB29	No	-	-	-	-	-	-	35	-
JB30	No	-	-	-	-	-	-	50	-
JB31	No	-	-	-	-	-	-	60	-
JB32	No	-	-	-	-	-	-	6	-
JB33	No	-	-	-	-	-	-	75	-
JB35	No	-	-	-	-	-	-	40	180
JB36	No	-	-	-	-	-	-	45	-
JB37	No	-	-	-	-	-	-	45	-
JB38	No	-	-	-	-	-	-	20	-
JB39	No	-	-	-	-	-	-	25	-
JB40	No	-	-	-	-	-	-	30	96
JB41	No	-	-	-	-	-	-	6	-
JB42	No	-	-	-	-	-	-	25	-
JB43	No	-	-	-	-	-	-	30	-
JB44	No	-	-	-	-	-	-	30	-
JB45	No	-	-	-	-	-	-	35	-
JB46	No	-	-	-	-	-	-	45	-
JB47	No	-	-	-	-	-	-	5	-
JB48	No	-	-	-	-	-	-	45	-
JB49	No	-	-	-	-	-	-	40	-
JB50	No	-	-	-	-	-	-	30	-
JB51	No	-	-	-	-	-	-	35	-
JB52	No	-	-	-	-	-	-	15	-
JB53	No	-	-	-	-	-	-	50	-
JB54	No	-	-	-	-	-	-	15	-
JB55	No	-	-	-	-	-	-	60	-
JB56	No	-	-	-	-	-	-	5	-

Site	Poweshiek Skipperling Present?	2002	2006	2008	2009	2010	2011	2012	2013
JK1	No	-	-	-	-	-	-	-	20
JK2	No	-	-	-	-	-	-	-	10

* site was surveyed from the roadside

Natural System Modifications (IUCN 7)

Fire and fire suppression (7.1)

Scope = Large; Severity = Serious – Slight

Prior to European colonization in North America, periodic wildfires maintained the open and expansive tall grass prairie habitats and species that require these habitats. Today, prescribed burning regimes are often used by managers to mimic these natural processes and maintain native prairie habitats. Prescribed burning reduces competing shrubby vegetation, slows natural vegetative succession and can reduce the extent and severity of wildfire by removing fine fuels.

Prescribed fire management is a balancing act: fire maintains open habitats but excessive burning can be detrimental to Poweshiek Skipperling populations (Swengel *et al.* 2010). Compared to wildfire, prescribed burns are often more frequent, more severe, larger, and occur outside the natural wildfire season (Orwig and Schlicht 1999). The Tall Grass Prairie Preserve follows a prescribed fire rotation of five years, a frequency designed in part to protect populations of butterflies and other invertebrates (Hamel pers. comm. 2014). The portion of the Tall Grass Prairie Preserve managed by the Nature Conservancy of Canada practises prescribed, rotational, early spring burning to maintain native tall grass prairie vegetation and several species at risk (Environment Canada 2012, Hamel *et al.* 2006).

Prescribed burns and/or grazing can be planned and implemented to optimize Poweshiek Skippering habitat and minimize mortality, but unplanned wildfires occur at irregular intervals and compound the threat of mortality. Wildfires in 2009 and 2011 burned the majority of conservation parcels in the south block (9 parcels in 2009 and 16 parcels in 2011) (Hamel *et al.* 2013). A single fire could plausibly burn most of the Poweshiek Skipperling habitat and therefore rapidly affect all individuals of the species in Canada.

Many Manitoba sites did not record Poweshiek Skipperlings for up to three years after prescribed burning. Four- to eight-year-old burn sites contained the highest populations, and ten-year-old burn sites had fewest individuals (Environment Canada 2012, citing J. Dupont and R. Westwood unpub. data). Spring fires probably kill overwintering larvae (Kornelsen *et al.* 2014). These data and similar conclusions from studies in the United States suggest that fire frequencies less than three to five years can result in extirpation of the Poweshiek Skipperling from a site if there is limited dispersal from nearby unburned sites (COSEWIC 2003).

Wildfire is an unpredictable disturbance that compounds the effects of prescribed burns and grazing. Wildfires burned parts of the Tall Grass Prairie Preserve in 2002, 2009, 2011, and 2012 (Kornelsen *et al.* 2014). Wildfire is thought to have led to the extirpation of Dakota Skipper at the Tall Grass Prairie Preserve (COSEWIC 2014). The prescribed fire rotation is adjusted when wildfires occur.

In summary, the present prescribed burning frequency has apparently been appropriate to maintain populations of Poweshiek Skipperling in the Tall Grass Prairie Preserve for the last several decades. However, unplanned wildfires at intervals of less than five years are a continuing threat when dispersal of Poweshiek Skipperlings from unburned patches is restricted (Swengel *et al.* 2010).

Invasive and Other Problematic Species and Genes (IUCN 8)

Invasive non-native/alien species (8.1)

Scope = Large; Severity = Slight

Non-native plants, such as Leafy Spurge (*Euphorbia esula*), Kentucky Bluegrass (*Poa pratensis*), St. Johnswort (*Hypericum perforatum*), Spotted Knapweed (*Centaurea maculosa*), Birdsfoot Trefoil (*Lotus corniculatus*), Reed Canary Grass (*Phalaris arundinacea*) and Smooth Brome (*Bromus inermis*) are rapidly spreading within native prairie habitats in North America (Cuthrell and Slaughter 2012, Hall *et al.* 2011, US Department of the Interior 2013). Invasion of these species can degrade Poweshiek Skipperling habitat through competition and displacement of larval host plants and preferred nectar plants. This list of invasive plants has been recorded within or near the Tall Grass Prairie Preserve. Leafy Spurge is increasing rapidly (Hamel *et al.* 2006). The sites managed by the Nature Conservancy of Canada are subject to prescribed burning, which may reduce the threat of invasive plants (Hamel *et al.* 2006).

In the United States, the spread of Glossy Buckthorn (*Rhamnus frangula*), a non-native shrub, threatens Poweshiek Skipperling populations in Michigan fens by shading and reducing nectar and larval host plant abundance (Cuthrell and Slaughter 2012). Glossy Buckthorn has not been recorded from southeastern Manitoba, and may be limited by climate (White *et al.* 1993) but is dispersed by birds and should be considered a potential threat. Additional invasive insects are not known to pose a threat to Poweshiek Skipperling (Hall *et al.* 2011).

Problematic Native Species (8.2)

Scope = Restricted; Severity = Moderate

The natural succession and encroachment of native woody vegetation, especially Trembling Aspen, is a major threat to the prairie habitat within in the Tall Grass Prairie Preserve (Hamel pers. comm. 2014). In the absence of fire, natural grazing processes or other vegetation management, Trembling Aspen ingrowth is accelerated and leads to the conversion of prairie to forest or woodland and the subsequent loss of Poweshiek Skipperling habitat. Prairies in northern Minnesota show a 75% increase in aspen coverage since the 1870s.

Agriculture and Aquaculture (IUCN 2)

Annual and perennial non-timber crops (2.1)

Scope = Small; Severity = Serious – Moderate

Although much of the tall grass prairie in Canada was converted to agricultural uses by the early 1900s, most of the remaining Poweshiek Skipperling habitat is in the Tall Grass Prairie Preserve and not likely to be converted to agriculture. Small areas of potential habitat occur on adjacent private property that could be ploughed and seeded to improve pasture for cattle (Environment Canada 2012).

Agricultural practices such as mowing help to removing the cuttings and maintain the prairie flora and vegetation structure by preventing or delaying succession to woody plants and reducing the accumulation of litter on the soil. However, if mowing is done before or during the flight period, the critical nectar sources are eliminated and the growth of exotic grasses such as Kentucky Bluegrass accelerates (McCabe 1981, Royer and Marrone 1992b, Dana 1997). Haying is more favourable for prairie butterflies than burning or grazing (Swengel 1996, 1998).

Livestock farming and ranching (2.3)

Scope = Restricted; Severity = Serious – Moderate

Domestic livestock grazing is a balancing act similar to fire management and there are differing results depending on the frequency, seasonal timing and livestock stocking density. Tall grass prairies are susceptible to overgrazing, which reduces adult nectar sources and removes forage for larvae (McCabe and Post 1977, Royer and Marrone 1992a, b).

Livestock grazing has occurred in the past ten years on approximately one third of sites surveyed for Poweshiek Skipperling in the Tall Grass Prairie Preserve (Kornelsen *et al.* 2014). Monitoring in the Tall Grass Prairie Preserve has found no relationship between Poweshiek Skipperling abundance and the presence/absence of grazing at the range of grazing intensity experienced during the five years of the study (Hamel pers. comm. 2014). Some of the sites supporting Poweshiek Skipperling have been grazed for decades (Hamel pers. comm. 2014).

The timing of grazing is important when maintaining flora and fauna within prairie habitats. Cattle grazing during the emergence period on one Manitoba site in 2013 resulted in the reduced abundance of nectar flowers and may have resulted in the absence of Poweshiek Skipperling on that site in 2013 (Kornelson *et al.* 2014). This same site was grazed from 2004 to 2007 and in 2012 and supported skipperling populations in 2011 and 2012.

In a study in the United States, Poweshiek Skipperling was less abundant in overgrazed prairies than in idle or hayed prairies (Swengel and Swengel 1999). In overgrazed prairies, exotic grasses such as Kentucky Bluegrass and Smooth Brome become the dominant species, and native plant richness and diversity declines (Dana 1997). Grazing at high density also increases the risk of trampling of larvae and pupae (Bleho and Koper 2013). Conversely, light rotational grazing is considered beneficial because it limits natural succession (Bleho and Koper 2013, Dana 1997). Compared to burning, grazing does not remove entire patches of vegetation, so some forbs are retained (Swengel 1996).

Human Intrusions and Disturbance (IUCN 6)

Recreational activities (6.1)

Scope = Large; Severity = Negligible

Recreational use within the Tall Grass Prairie Preserve includes hiking and wildlife viewing, primarily along existing trails (Hamel pers. comm. 2013). The impacts on Poweshiek Skipperling are unknown, but probably negligible.

Work and other activities (6.3)

Scope = Large; Severity = Unknown

Poweshiek Skipperling population monitoring is completed under the conditions of research permits from (i) the Manitoba Conservation and Water Stewardship Wildlife Branch and (ii) the Tall Grass Prairie Management Committee. Permits are issued to coordinate the efforts of surveyors to minimize disturbance to vegetation and restrict the number of skipperlings collected. Other research activities within the preserve are also coordinated by the Tall Grass Prairie Management Committee such that work on one species at risk does not adversely impact another.

Climate Change and Severe Weather (IUCN 11)

Habitat shifting and alteration (11.1)

Scope = Unknown; Severity = Unknown

Climate change could lead to shifts in plant communities, which in turn could affect Poweshiek Skipperling survival and reproduction if nectar sources are not available during the critical adult flight period (Environment Canada 2012).

Droughts (11.2)

Scope = Unknown; Severity = Unknown

Poweshiek Skipperling populations in Canada occur within an extremely limited range and are vulnerable to severe weather conditions such as low temperatures, late frosts, unusually cool and wet growing seasons, or drought that could potentially eliminate an entire population (Selby 2005). Increases in dry, windy weather could increase the severity of wild fires.

Storms and Flooding (11.4)

Scope = Small; Severity = Unknown

Some Poweshiek Skipperling habitat is vulnerable to flooding from heavy spring runoff and severe rainstorms, although these specific areas are not mapped. Natural flooding has probably always occurred on these sites, although the frequency and severity of these hydrological processes may have been altered by ditches and stream channelization (Environment Canada 2011), road building (Kornelsen *et al.* 2014) and climate change (Lemmen and Warren 2004).

Poweshiek Skipperling habitat is outside the floodplains of the Red and Assiniboine rivers, where major floods occurred in 1997, 2009, and 2011 (Statistics Canada 2013). The Roseau River watershed has also experienced increasing frequency of spring and summer flooding over the last decade (Roseau River International Watershed 2007). Most of the flooding occurs near the confluence of the Roseau and Red rivers, downstream of any known Poweshiek Skipperling habitat.

Threats considered negligible within the Canadian range of Poweshiek Skippering include:

Residential and Commercial Development (IUCN 1)

Housing and urban areas (1.1) and Commercial and industrial areas (1.2)

Scope = Negligible; Severity = Slight

Human settlement and similar non-agricultural land uses is not a significant threat to Poweshiek Skipperling populations in Canada. Historically, southeastern Manitoba was not as intensively developed as more well-drained areas farther west due to the lower agriculture value of the land (Nature North 2014). The human population remains low and the Tall Grass Prairie Preserve is more than 60 km from the nearest urban centre. Most habitat is owned and managed by the Nature Conservancy of Canada and unlikely to be converted to other uses. Small areas of potential habitat may occur on adjacent private property although it is unlikely these areas will be converted by urban or commercial development.

Tourism and recreational areas (1.3)

Scope = Negligible; Severity = Slight

The expansion and construction of washroom facilities, parking lots or trails within the Tall Grass Prairie Preserve is not considered a high threat. Recreational facility expansion within the Tall Grass Prairie Preserve includes precautionary measures to prevent the unintentional loss of prairie species at risk.

Transportation and Service Corridors (IUCN 4)

Roads and railroads (4.1)

Roads can act as barriers to movement of Poweshiek Skipperlings (Westwood 2010) and existing roads may restrict dispersal between habitat patches. There is no planned road or right-of-way expansion within or adjacent to the Tall Grass Prairie Preserve and this is not considered a threat within the next ten years.

Pollution (IUCN 9)

Household Sewage and urban waste water (9.1)

Scope = Small; Severity = Negligible

Contamination from septic tanks, field runoff, and road salt has contributed to degradation of Poweshiek Skipperling habitat in Michigan by facilitating the spread of the invasive plant species Narrow-leaved Cattail (*Typha angustifolia*) and Common Reed (*Phragmites australis ssp. australis*) (Cuthrell and Slaughter 2012). These factors are not considered threats in Manitoba (Hamel *et al.* 2006).

Number of Locations

Poweshiek Skipperling has 2 – 5 locations based on the simultaneous threat of natural succession of native vegetation, and the adverse impacts from land management practices (e.g., prescribed burning, livestock grazing) used to mimic natural disturbance factors (e.g., wildfire and grazing by Plains Bison) within the two main population centres for the species. The uncertainty around the number of locations reflects the time to and uncertainty of recolonization at a site. There is uncertainty between local extirpation and recolonization of that site from adjacent unburned patches. In addition, there is an unknown probability of wildfire.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

Poweshiek Skipperling is listed as Endangered in Manitoba under the provincial Manitoba Endangered Species Act (Manitoba Conservation 2014) and Threatened in Canada under the federal *Species at Risk Act* (SARA) (July 2005). A recovery strategy is written (Environment Canada 2012) and Critical Habitat is identified within thirteen quarter sections in and adjacent to the Manitoba Tall Grass Prairie Preserve and includes habitat for approximately 99% of the Canadian population.

Non-Legal Status and Ranks

In February 2013, the global status of Poweshiek Skipperling was uplisted from G2G3 (imperiled-vulnerable) to G1 (critically imperiled) on the basis of the population collapse throughout its core range in the last decade (NatureServe 2014). The species is ranked as N2 (imperiled) in Canada and N1 (imperiled) in the United States. The General Status rank for Canada is "May Be at Risk" (2) (Wild Species 2014).

The subnational conservation status ranks in the United States are: Illinois (SH), Indiana (SH), Iowa (S1), Michigan (S1S2), Minnesota (S3), North Dakota (SNR), South Dakota (S2), Wisconsin (S1) (NatureServe 2014). In the United States, Poweshiek Skipperling was proposed for listing as Endangered under the federal *Endangered Species Act* in October 2013 (United States Department of the Interior 2013). At the state level, it is listed as Special Concern in Minnesota (Minnesota Department of Natural Resources 2014), Threatened in Michigan (Michigan Natural Features Inventory 2014), and Endangered in Wisconsin (Wisconsin Department of Natural Resources 2014).

Habitat Protection and Ownership

The Manitoba Tall Grass Prairie Preserve (3332 ha) includes most Poweshiek Skipperling habitat in Canada, although a few sites outside the preserve are privately owned. The preserve is administered by a partnership between Manitoba Conservation (provincial government), Nature Manitoba, Manitoba Habitat Heritage Corporation (non-profit Crown Corporation), Environment Canada (federal), the Manitoba Tall Grass Prairie Preserve Local Advisory Committee, and the Nature Conservancy of Canada (private conservation organization). The lands are managed to conserve biodiversity through prescribed burning, haying, and grazing (Hamel *et al.* 2006, Environment Canada 2013). Most lands have been acquired through purchase, but some parcels are secured through leases or conservation agreements (Hamel *et al.* 2006, Environment Canada 2013).

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Allan Harris is a biologist with over 25 years' experience in northern Ontario. He has a B.Sc. in Wildlife Biology from the University of Guelph and an M.Sc. in Biology from Lakehead University. After spending seven years as a biologist with the Ontario Ministry of Natural Resources, he co-founded Northern Bioscience, an ecological consulting company based in Thunder Bay, Ontario. Al has authored or coauthored dozens of scientific papers, technical reports, and popular articles, including COSEWIC status reports for Riverine Clubtail, Laura's Clubtail, Rapids Clubtail, Gibson's Big Sand Tiger Beetle, Northern Barrens Tiger Beetle, Poweshiek Skipperling, Mormon Metalmark, Weidemeyer's Admiral, Bogbean Buckmoth, Hop-tree Borer, Georgia Basin Bog Spider, Broad-banded Forestsnail, Nahanni Aster, Crooked-stem Aster, Bluehearts, Drooping Trillium and Small-flowered Lipocarpha. Al also authored the Ontario provincial status report for woodland caribou, and has authored or coauthored national and provincial recovery strategies for vascular plants and birds.

Robert Foster is co-founder and principal of Northern Bioscience, an ecological consulting firm offering professional consulting services supporting ecosystem management, planning, and research. Dr. Foster has a B.Sc. in Biology from Lakehead University and a D. Phil in Zoology from the University of Oxford. Rob has worked as an ecologist in Ontario for over 20 years, and has authored or coauthored COSEWIC status reports on the Riverine Clubtail, Laura's Clubtail, Rapids Clubtail, Gibson's Big Sand Tiger Beetle, Northern Barrens Tiger Beetle, Poweshiek Skipperling, Mormon Metalmark, Weidemeyer's Admiral, Bogbean Buckmoth, Hop-tree Borer, Georgia Basin Bog Spider, Broad-banded Forestsnail, Nahanni Aster, Crooked-stem Aster, Bluehearts, and Drooping Trillium, as well as recovery plans for rare plants, lichens, and odonates. Rob has conducted numerous odonate surveys for protected areas planning and environmental assessments in Ontario, as well as Manitoba, Minnesota, Québec, and British Columbia.

COLLECTIONS EXAMINED

The following collections were examined as part of the COSEWIC (2003) status report:

Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario (visited during February 2002)

University of Manitoba Collection, Winnipeg, Manitoba (visited during July 2002)

Smithsonian Institute, Washington, DC (visited April 2002)

Additional collections contacted as part of the updated status report but with no records:

Beaty Biodiversity Museum, Spencer Entomological Collection, Vancouver, British Columbia (K. Needham pers. comm. 2014).

Royal British Columbia Museum, Victoria, British Columbia (C. Copley pers. comm. 2014)

Royal Saskatchewan Museum, Regina, Saskatchewan (C. Sheffield pers. comm. 2014)